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PATENT SPECIFICATION

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Applicants — — — — — — — — Ames Irrigation Pty. Ltd.

Actual Inventor — — — — — — — — Robert Arthur Carrick.

Convention Application
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Classification: 74.5
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Drawing attached.

COMPLETE SPECIFICATION

"Sealing ring."

The following statement is a full description of this invention, including the best method of performing it known to us:—

This invention relates to an improved coupling and to an improved gasket or sealing ring for use in a pipe coupling.

A frequently used coupling to which the invention is applicable employs male and female couplers provided with a matching pair of circumferential grooves across which a flexible element is inserted to lock the coupler together against axial movement. For such couplers, a gasket or sealing ring is required to obtain a tight seal, and heretofore an elastomeric O-ring of circular cross-section has generally been seated in an additional circumferential groove in the female coupler. However, these O-rings have had the disadvantage of not sealing properly unless made to a rather close tolerance, whereas in pipe sizes rather wide manufacturing tolerances are permitted within what is supposed to be the same size.

For example, in pipe nominally of 2" diameter, the male coupler may be 2" plus or minus 1/32" in diameter, and in pipe nominally of 4" diameter, the male coupler may be 4" plus or minus 1/16" in diameter, due to permissible manufacturing tolerances. So if a "4 inch" O-ring were made to accommo-

date the smallest diameter male coupler within the range of permissible tolerances, it would have an inside diameter of about 3-15/16", and it would be very difficult to insert a 4-1/16" diameter pipe, which also lies within the range of tolerances. If, on the other hand, the O-ring were made to an inside diameter of 4-1/16", a 4" pipe would leak when coupled. With a 4" O-ring the 4-1/16" pipe would still be too tight, and the 3-15/16" pipe would lead to leaks. Thus the problems have been the failure of conventional gaskets of sealing rings to accommodate the manufacturing tolerances in pipe diameters within a given nominal size, and the resultant difficulty of coupling and uncoupling the pipes when the gasket is too small or else leakage when the gasket is too large.

In the construction of the present invention the coupling employs a different type of sealing gasket in combination with the male and female coupler elements, so that conventional manufacturing tolerances can be accommodated without causing leaks in some pipes and over-tightness in others.

Thus, an important object of the present invention is to provide a novel gasket and a novel coupling unit employing such gasket that accommodates a wide range of tolerances within a given pipe size without either leaking or unduly increasing the difficulty of coupling and uncoupling.

The invention comprises a pipe coupling comprising a thin-walled female coupler having a cylindrical wall formed to provide a circumferential annular groove on its inner surface substantially semicircular in cross section and lying radially beyond the inner surface of the remainder of the wall; a cylindrical male coupler adapted to be pushed in and out of said female coupler whenever said coupling is to be coupled or uncoupled; and a sealing gasket of elastomeric material having, as seen in cross-section, a radially outer body portion with a substantially semicircular periphery that fits in said groove, said groove and said gasket peripheries having substantially identical radii, and said gasket having axially inwardly extending arcuate grooves at both ends at the ends of said semicircular periphery to provide a waist between them, and legs extending radially inwardly and axially outwardly from said waist and from each other, a radially inner generally axial surface having an annular circumferential channel which in cross-section is a concave circular arc dividing said legs from each other, so that said legs are free to expand radially outwardly as they embrace said male coupler when it is inserted in said female coupler, while said body portion holds the whole gasket in said groove and prevents it from rolling while supporting said legs in sealing position.

The invention further comprises an annular sealing gasket of elastomeric material having, as seen in cross section, a semicircular radially outer body portion, an axially inwardly extending annular arcuate groove at each end of said body portion providing a waist between said grooves, a leg extending radially inwardly and axially outwardly from each end of said waist, and a radially inner axial wall having an annular circumferential channel which in cross-section is a circular arc dividing said legs from each other, whereby said legs are free to expand radially outwardly as they embrace the wall of a cylindrical member inserted through said gasket, while said body portion can be engaged to hold said gasket and prevents it from rolling while supporting said legs in sealing position.

Other objects and features will appear from the following description of certain preferred embodiments which are illustrated in the accompanying drawings, in which:

Figure 1 is a view in side elevation of a coupling of the present invention with the ends broken off in order to conserve space,

Figure 2 is a view in elevation and in section of the coupling of Figure 1,

Figure 3 is a view in side elevation

of a gasket or sealing ring embodying the present invention,

Figure 4 is a view in end elevation of the gasket of Figure 3,

Figure 5 is an enlarged view in cross section taken along the line 5-5 in Figure 4,

Figure 6 is a view similar to Figure 5 showing a modified form of gasket,

Figure 7 is another view similar to Figure 5 of another modified form of gasket, and,

Figure 8 is another view similar to Figure 5 showing an additional modified form of gasket.

The coupling 10 shown in Figures 1 and 2 includes a female coupler 11 and a male coupler 12, either of which may be formed as the ends of integral pipes or as units secured separately to the ends of pipes. The male coupler 12 is cylindrical except for a single circumferential groove 13 which extends radially inwardly. The female coupler 11 has a corresponding radially outwardly extending circumferential groove 14 that is provided with a perforation or opening 15, into which a locking member 16, such as a coil spring, may be inserted to lock the two members 11 and 12 together.

The female coupler 11 also has a second circumferential groove 17 not having an insert opening but provided with a substantially semicircular inner wall. Within this groove 17 is held a gasket 20, which is a most important part of the present invention, and this gasket 20 engages the smooth cylindrical wall portion 18 of the male coupler 12 in a leak-tight fit.

The gasket 20 will be better appreciated from the large cross-sectional views, Figures 5 to 8, but it will be seen from Figures 3 and 4 that it is annular, continuous, elastomeric, and that it has a generally semicircular body portion 21 with an outer periphery 22 that is either a complete semi-circle or very close to it. The periphery 22 usually comprises 95% or more of a complete semicircle, but rarely extends past a complete semicircle and preferably should not.

The body portion 21 comprises the outer part of the section through the gasket 20 (see Figure 5), while inside this outer body 21 is a waist portion 23 lying completely within the circle that would be formed by a continuation of the semicircular periphery 22. In effect, the waist 23 may be considered as defined by a pair of circumferential, sectionally arcuate grooves 24 and 25, which extend in from the opposite axial ends 26 and 27 (Figure 3). Preferably, the grooves 24 and 25 are made so that in cross-section they comprise a circular arc.

The radially inner periphery 30 of the sealing ring 20 is preferably made concave, along a circular arc 31 as seen in cross-section. Extending out in opposite axial directions from the waist 23 and extending radially inwardly from it on opposite sides of the concave periphery 30 are a pair of legs 32 and 33 whose outer extremities may also comprise circular arcs 34 and 35 as seen in cross-section, which arcs preferably are continuous with, but of opposite curvature to, the circular arcs 24, 25, and 31.

In determining the exact configuration of any one gasket 20 for a particular "size" of pipe couplers 11 and 12, the first thing to be taken into consideration is the size of the groove 17, because it is desirable that the semicircular periphery 22 fit snugly into the semicircular groove 17; so they should be of substantially the same radii. The next thing to consider is the size of the male coupler 12 and the range of permissible tolerances. When the largest coupler 12 of that size is used, the distance from the radially outermost part 34 of the groove 17 and gasket 20 to the radially outermost part 35 of the concave portion 30 should not be greater than the distance from the part 34 to the surface 18 of the coupler 12, in order for that coupler to fit in. Similarly, the radial component of the distance from the part 34 to the radially

innermost periphery 36 (the radial distance to the imaginary tangential cylinder 37 of Figure 5) should not be less than the distance from the part 34 to the surface 18 of the smallest coupler 12 of the size concerned. Once these dimensions are determined, the grooves 24, 25, and 30 and legs 32 and 33 are worked out to conform to them, to give convenient flexing sections, and to give configurations that are convenient to manufacture.

In the gasket 20, the legs 32 and 33 (in their normal unflexed position, that is to say before they are flexed radially and axially outwardly by insertion of the coupler 12) may extend axially to lines 38 and 39 substantially flush with the radial planes 40 and 41 on which the semicircular body 21 terminates. In fact, in this particular drawing of Figure 5 they are exactly flush. However, as shown in the gaskets 50 and 60 in Figures 6 and 7, the legs 51, 52 and 61, 62 may extend radially beyond the corresponding planes 53, 54 and 63, 64 a short distance. Otherwise, the construction of the gaskets 50 and 60 in Figures 6 and 7 is substantially the same as that of the gasket 20 in Figure 5. However, it will be noted that the centres 55, 65 of the arcuate leg ends still lie within the area bounded by the radial planes 53, 54 and 63, 64 and that the ends of the legs 51, 52 and 61, 62 themselves are not very far beyond these planes. The ratio of axial lengths between (1) the axially furthest part of the legs and (2) the radial planes, may vary in range between about 4:5 to about 5:4. Examples of extremes are shown in Figures 6 and 8.

In the gasket 70 in Figure 8 the legs 71, 72 lie entirely within the volumes bounded by radial planes 73, 74 through the ends of the gasket's body portion. So long as the legs are substantially flush with the radial planes or within the range of 4:5 to 5:4, it does not seem to make much difference what the exact proportions are, and for some purposes the ratios may even lie somewhat outside this range. The important thing is that the inner diameter (the cylinder 37) of the legs be smaller than the smallest tolerance within the permissible range of coupler diameter and that the widest portion 35 of the inner axial groove 30 be as great as the largest tolerance within that range. For smaller sizes of pipe the tolerance lies near 1 32", in larger sizes it may be 1/16" or larger.

The gasket is easily inserted in the same manner as an O-ring into the groove 17, and then the male coupler 12 may be pushed into the female coupler 11. It will usually force the gasket legs out as shown in Figure 2. The insertion of the pipe is stopped when the two locking grooves 13 and 14 are opposite each other; the locking member 16 is then inserted through the opening and the coupling 10 is then joined in a leak-tight fit.

The specific constructions described and illustrated are given by way of exemplification and the invention is not limited to the details thereof.

The claims defining the invention are as follows:—

1. A pipe coupling comprising a thin-walled female coupler having a cylindrical wall formed to provide a circumferential annular groove on its inner surface substantially semicircular in cross section and lying radially beyond the inner surface of the remainder of the wall; a cylindrical male coupler adapted to be pushed in and out of said female coupler whenever said coupling is to be coupled or uncoupled; and a sealing gasket of elastomeric material having, as seen in cross-section, a radially outer body portion with a substantially semi-circular periphery that fits in said groove, said groove and said gasket peripheries having substantially identical radii, and said gasket having axially inwardly and legs extending arcuate grooves at both ends at the ends of said semicircular periphery to provide a waist between them, extending radially inwardly and axially outwardly from said waist and from each other, a radially inner generally axial surface having an annular circumferential

channel which in cross-section is a concave circular arc dividing said legs from each other, so that said legs are free to expand radially outwardly as they embrace said male coupler when it is inserted in said female coupler, while said body portion holds the whole gasket in said groove and prevents it from rolling while supporting said legs in sealing position. (7 April, 1958.)

2. The coupling of Claim 1 wherein said waist portion lies entirely within the circle of which said body portion comprises one half. (7 April, 1958.)

3. The coupling of Claim 1 wherein each said leg terminates in an outer end portion, which when seen in cross-section comprises a second circular arc continuous on one side with the adjacent said arcuate groove but of opposite curvature and continuous on the other side with the circular arc forming said channel but of opposite curvature. (7 April, 1958.)

4. The coupling of Claim 3 wherein the centre of said second circular arc lies axially between the ends of said semicircle. (7 April, 1958.)

5. The coupling of Claim 1 wherein said legs before engagement with said male coupler terminate at opposite axial ends substantially on the radial planes at which said body portion terminates. (7 April, 1958.)

6. The coupling of Claim 1 wherein the axial distance between said legs and the axial length of said body bear a ratio to one another in the range between 4:5 and 5:4, approximately. (7 April, 1958.)

7. A pipe coupling comprising a female coupler having an annular generally rounded circumferential groove in its inner surface, a cylindrical male member adapted to be pushed in and out of said female end whenever said coupling is to be coupled or uncoupled, and a sealing gasket having a body portion of elastomeric material having, as seen in cross-section, a generally rounded periphery to fit said groove and having legs depending from said body portion, each leg projecting in an axial direction to a point axially short of the axial end of said rounded portion, said body portion having end faces with an annular groove between the edge of said rounded periphery and a back side of the adjacent leg, whereby said legs are free to expand radially outwardly as they embrace the wall of a male member inserted in said female coupler, and the greater axial width of said rounded peripheral portion holds the whole gasket from rolling while supporting said legs in sealing position. (7 April, 1958.)

8. An annular sealing gasket of elastomeric material having, as seen in cross section, a semicircular radially outer body portion, an axially inwardly extending annular arcuate groove at each end of said body portion providing a waist between said grooves, a leg extending radially inwardly and axially outwardly from each end of said waist, and a radially inner axial wall having an annular circumferential channel which in cross-section is a circular arc dividing said legs from each other, whereby said legs are free to expand radially outwardly as they embrace the wall of a cylindrical member inserted through said gasket, while said body portion can be engaged to hold said gasket and prevents it from rolling while supporting said legs in sealing position. (7 April, 1958.)

9. A sealing gasket adapted to fit in an annular generally rounded groove in the female end of a pipe coupling to seal in said groove and on the wall of a male member adapted to be pushed in and out of said female end whenever said pipe is to be coupled or uncoupled, comprising: a body portion of elastomeric material, said body portion, when seen in cross-section, having a generally rounded periphery to fit the groove in the female end of said coupling, and having legs depending from said body portion, wherein each leg projects in an axial direction less than the axial width of said rounded portion; and wherein said body portion is grooved annularly on its radial faces between

the edge of said rounded periphery and the back side of the adjacent leg, whereby said legs are free to expand radially outwardly as they embrace the wall of a male member inserted in said female end of the coupler, and the greater axial width of said rounded peripheral portion holds the whole body from rolling and supports said legs in sealing position. (7 April, 1958.)

10. A pipe coupling, substantially as illustrated in Figures 1 and 2 of the accompanying drawings and substantially as hereinbefore described. (7 April, 1958.)

11. An annular sealing gasket, substantially as illustrated in Figures 3 to 5 of the accompanying drawings and substantially as hereinbefore described. (7 April, 1958.)

12. An annular sealing gasket, substantially as illustrated in Figure 6 of the accompanying drawings and substantially as hereinbefore described. (7 April, 1958.)

13. An annular sealing gasket, substantially as illustrated in Figure 7 of the accompanying drawings and substantially as hereinbefore described. (7 April, 1958.)

14. An annular sealing gasket, substantially as illustrated in Figure 8 of the accompanying drawings and substantially as hereinbefore described. (7 April, 1958.)

GRIFFITH, HASSEL & FRAZER,

Patent Attorneys for the Applicants.

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References:

Serial No.	*Application No.*	*Classification*
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213,382	27,514/57	74.5

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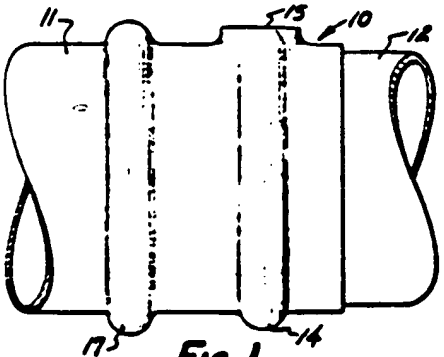

FIG. 1

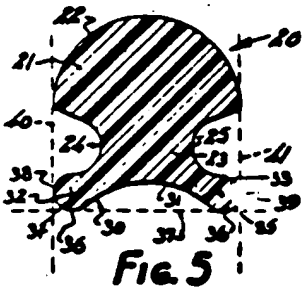

FIG. 5

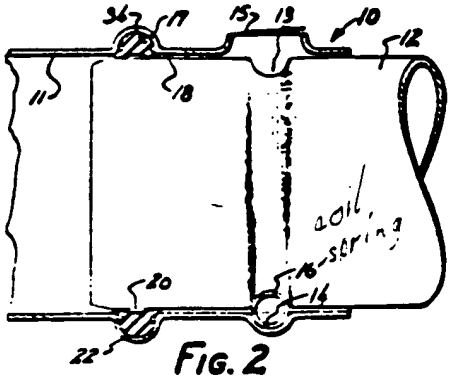

FIG. 2

FIG. 6

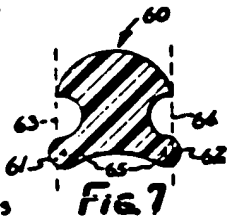

FIG. 7

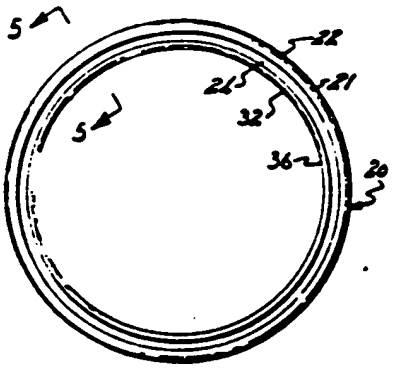

FIG. 4

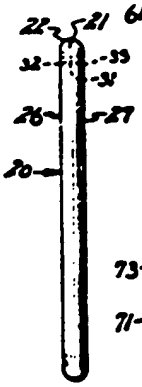

FIG. 3

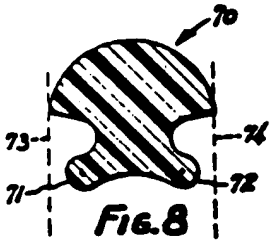

FIG. 8

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